Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign

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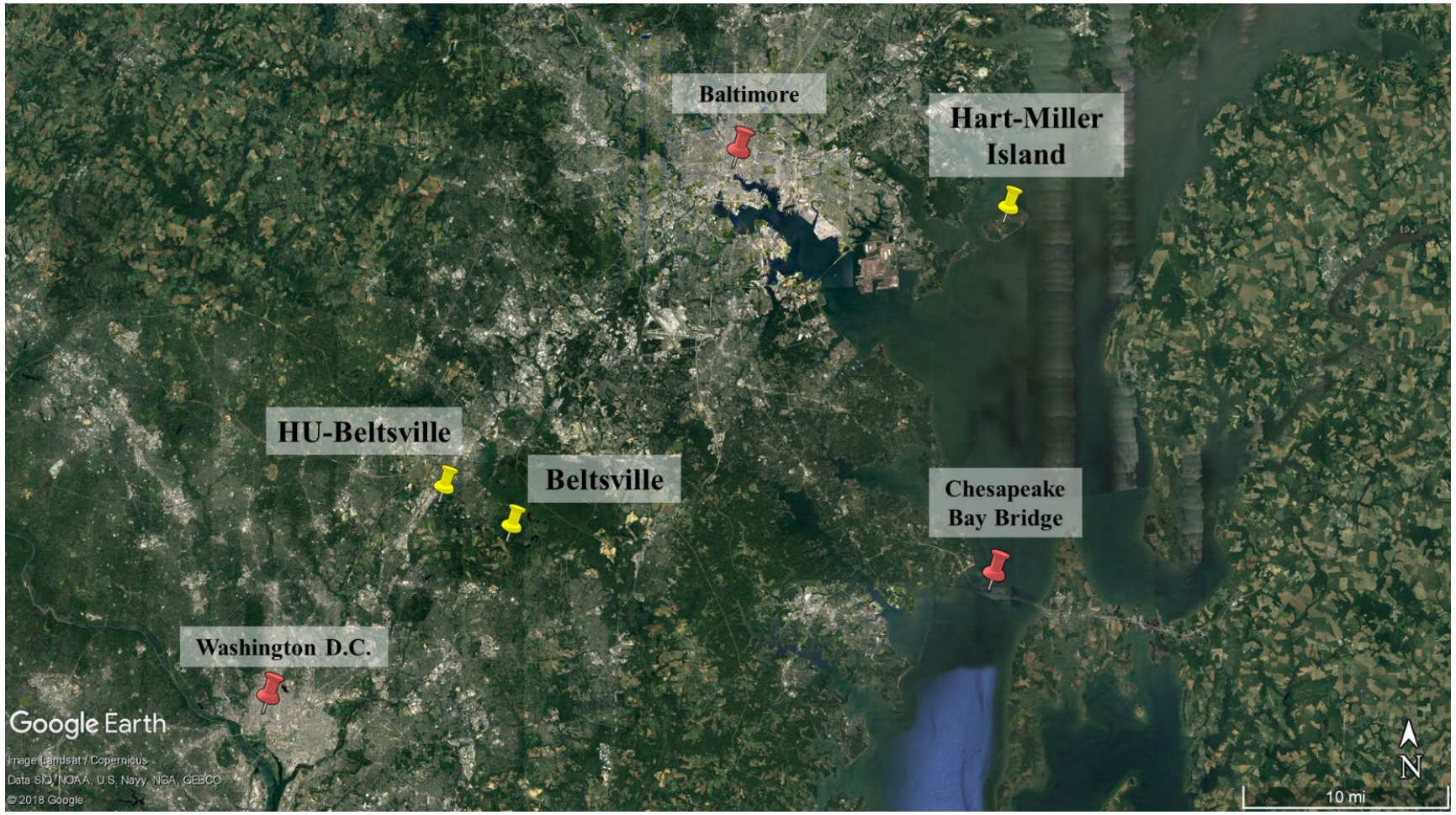
Chemical
Biochemical and
Environmental
Engineering

Location

- Measurements made in Summer 2018 on **Hart-Miller Island (HMI)**
- HMI is on the Chesapeake Bay, an estuary located in MD and VA



Measurements

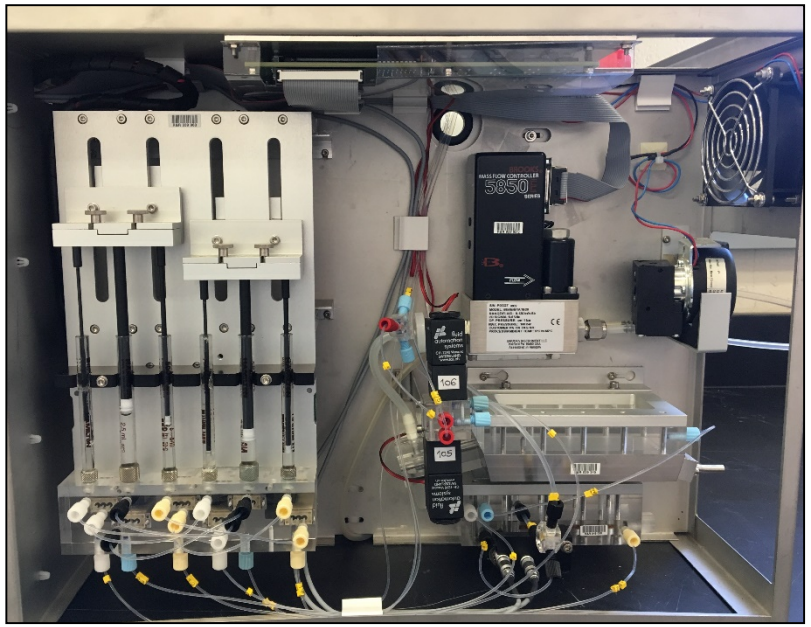
Measurements included:

1. Speciated Inorganic $PM_{2.5}$
2. Gas-phase NH_3
3. Meteorology (T, RH, WS, WD)

PILS-IC (Valerino et al., *JGR*, 2017)

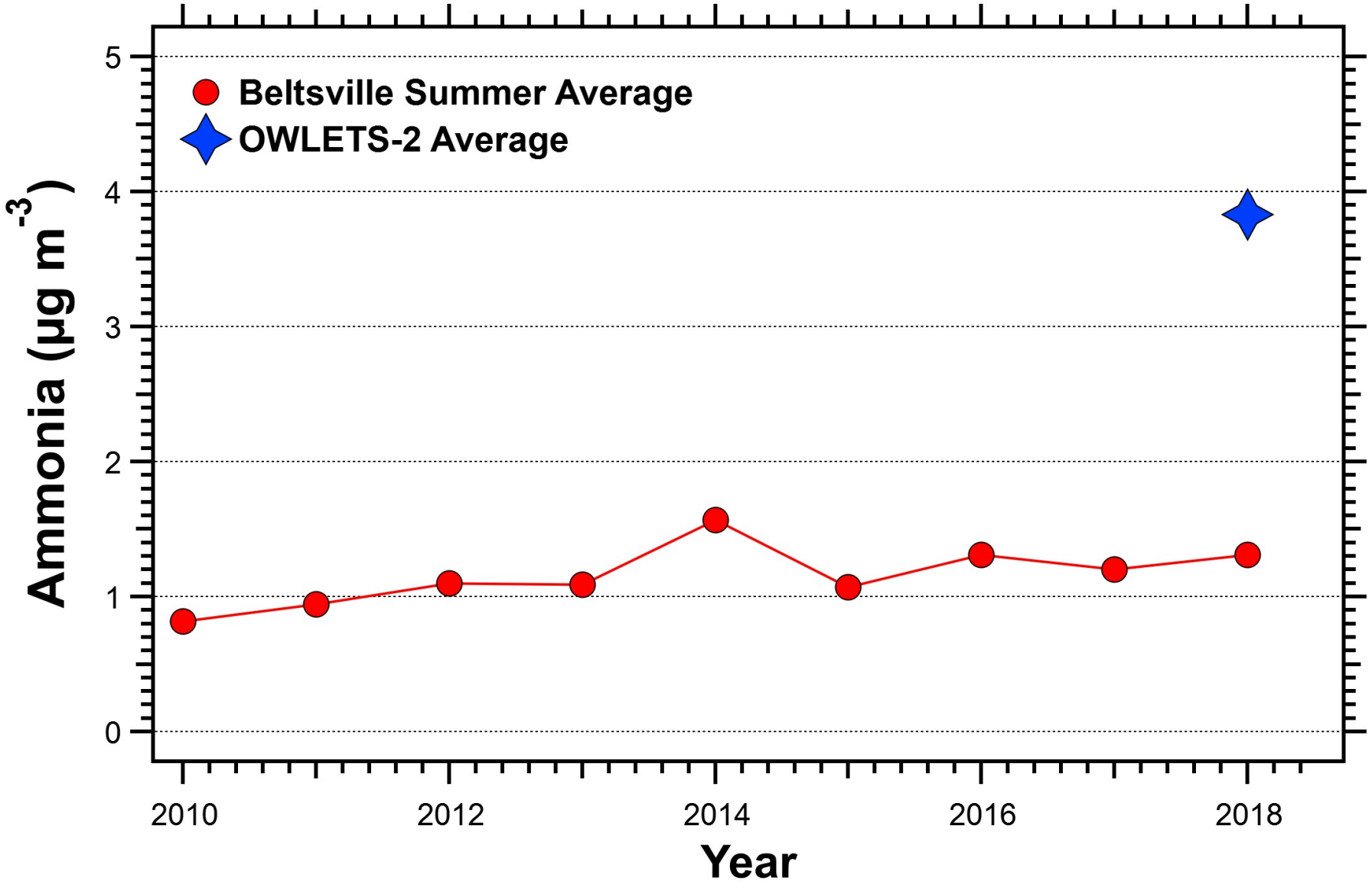
Aerosol: Cl^-, NO_3^-, SO_4^{2-}, $C_2O_4^{2-}$, Na^+, NH_4^+, K^+, Ca^{2+}, Mg^{2+} (20-min resolution)

AiRRmonia (Norman et al., ACP, 2009)

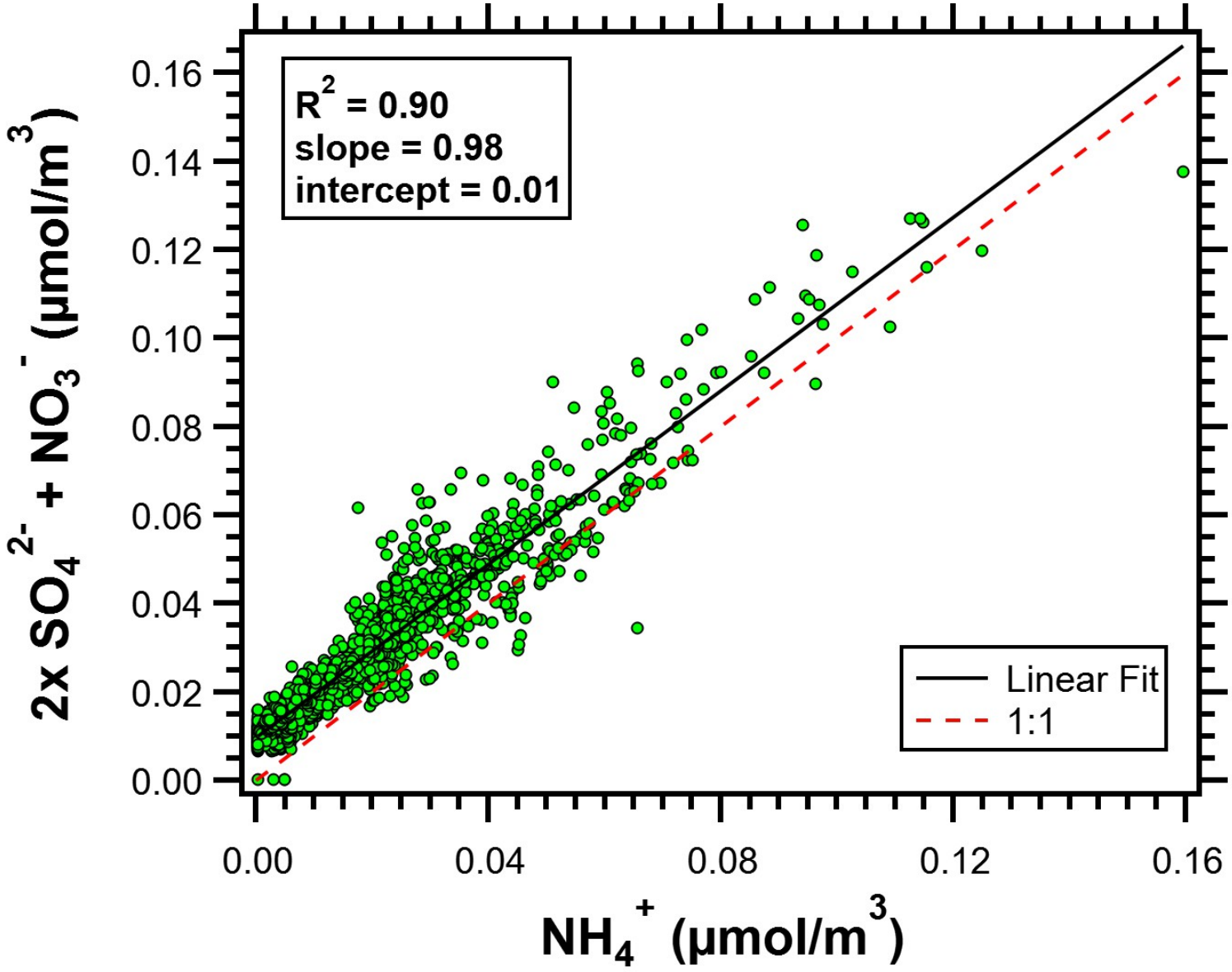


Gas-phase: NH_3 (10-min resolution)

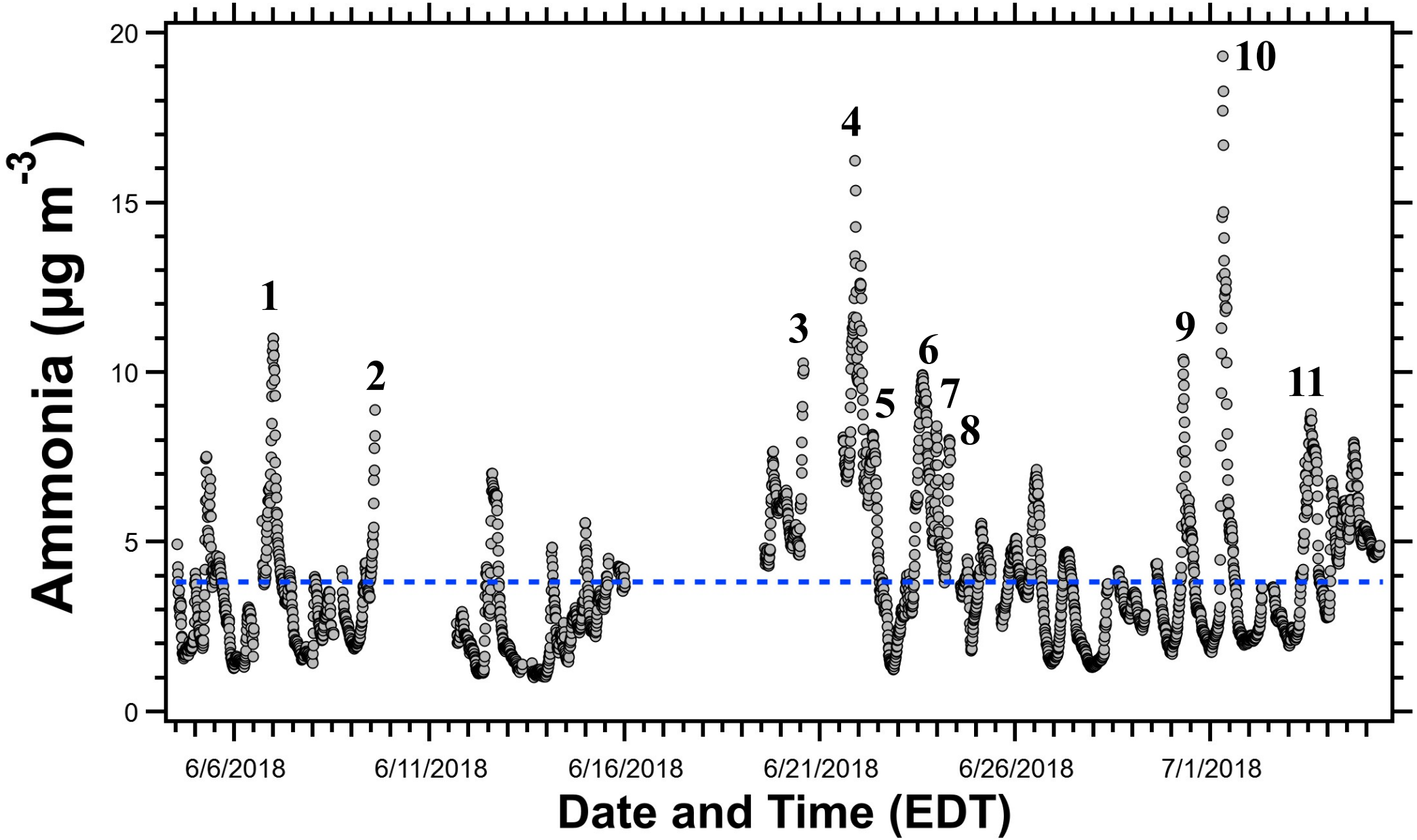
Elevated NH_3 During OWLETS-2



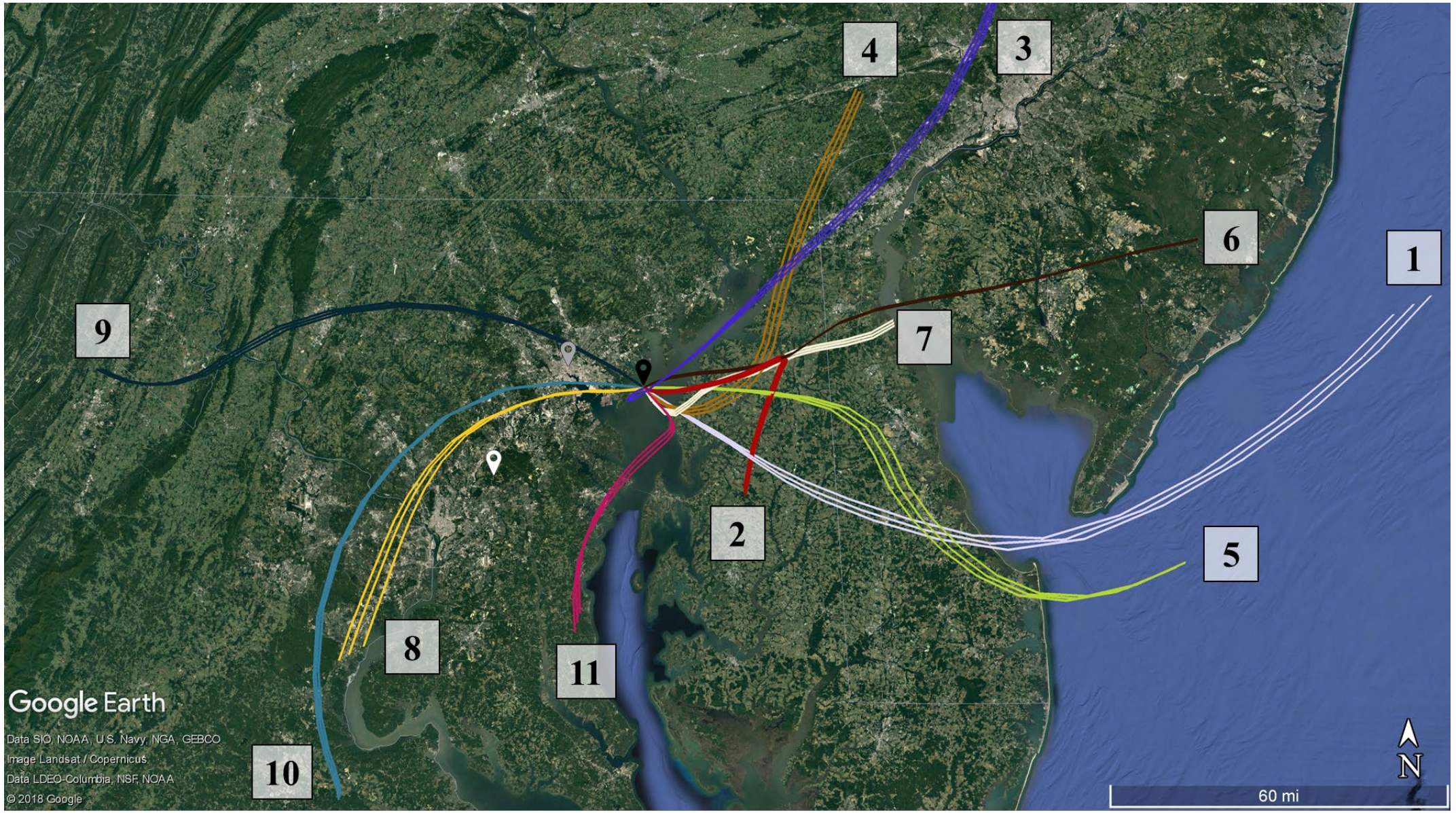
NH_4NO_3 and $(NH_4)_2SO_4$ Significant Components of $PM_{2.5}$



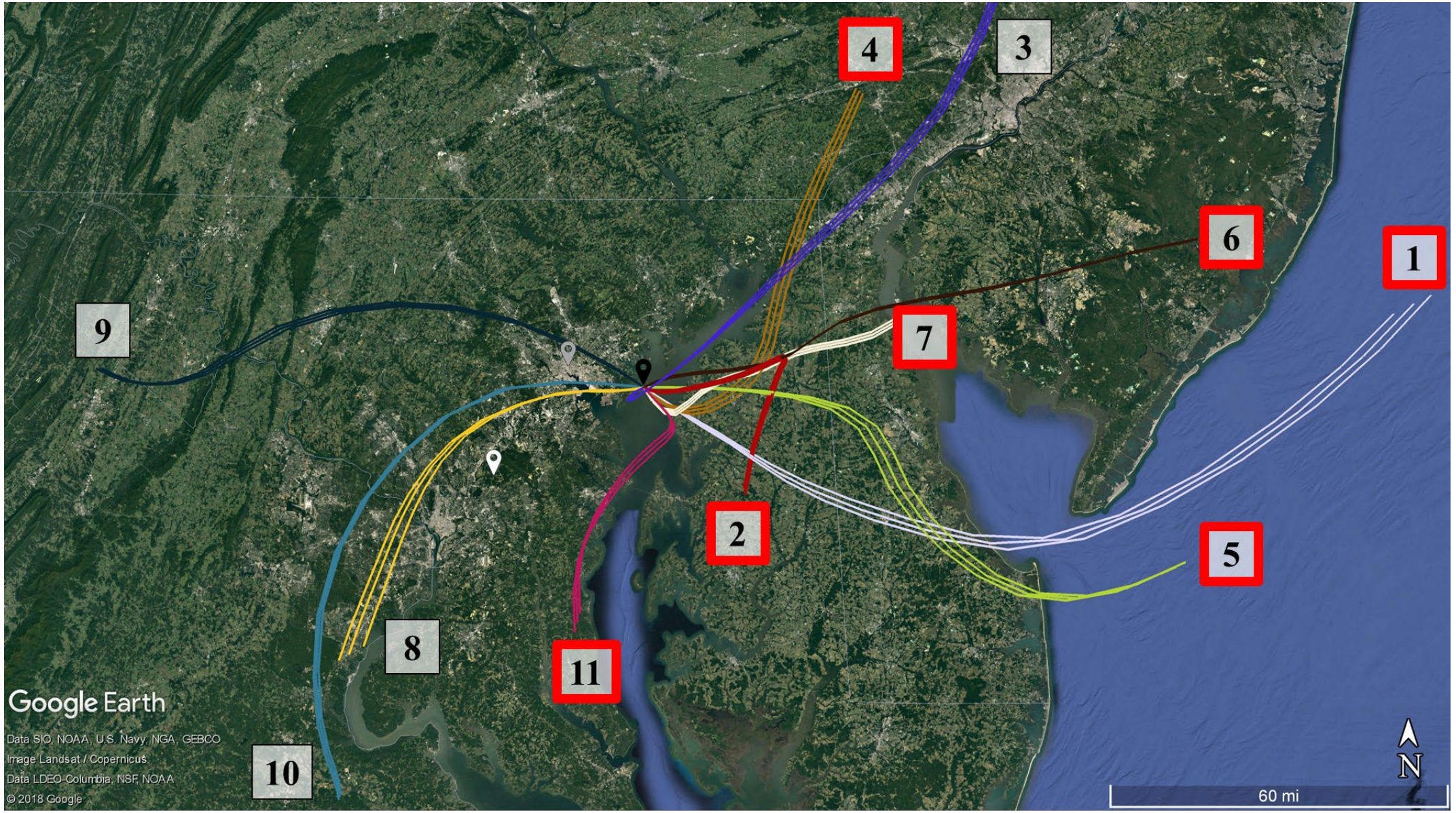
Investigating Peak NH_3 Events



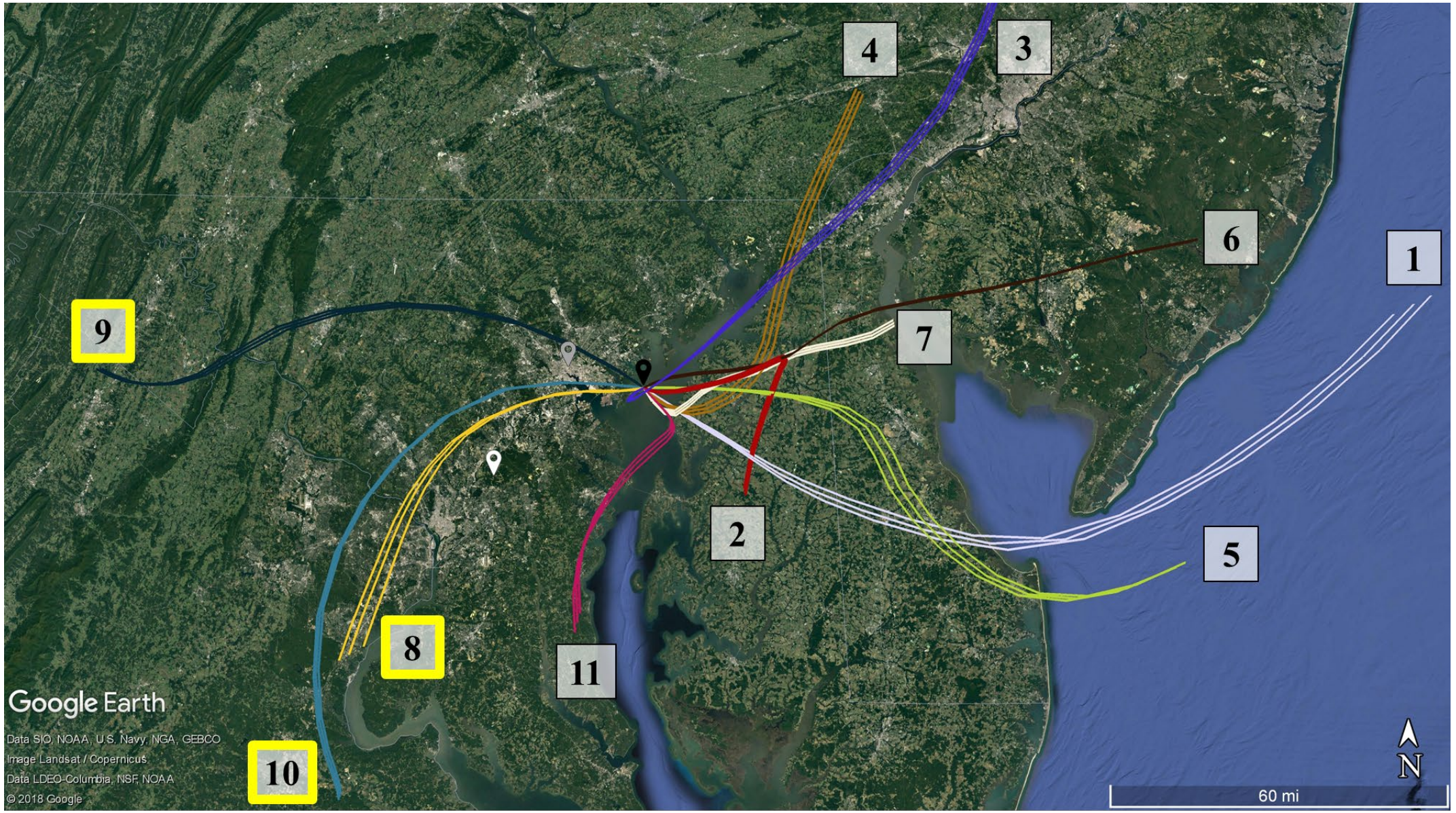
Investigating Peak NH_3 Events



Agricultural Sources of Ammonia

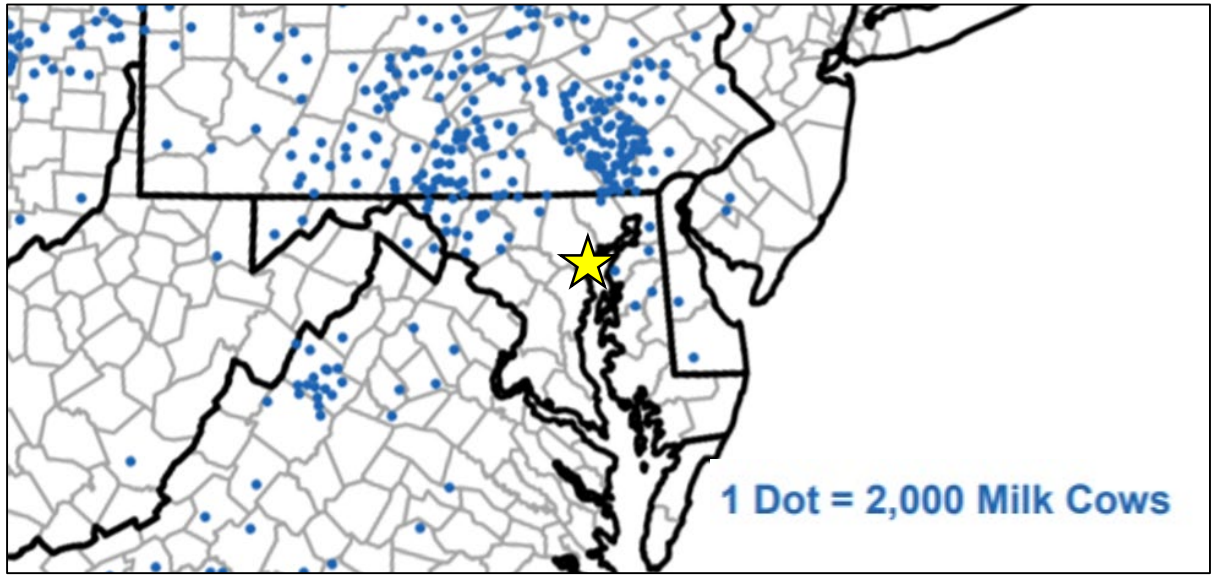


Industrial Sources of Ammonia

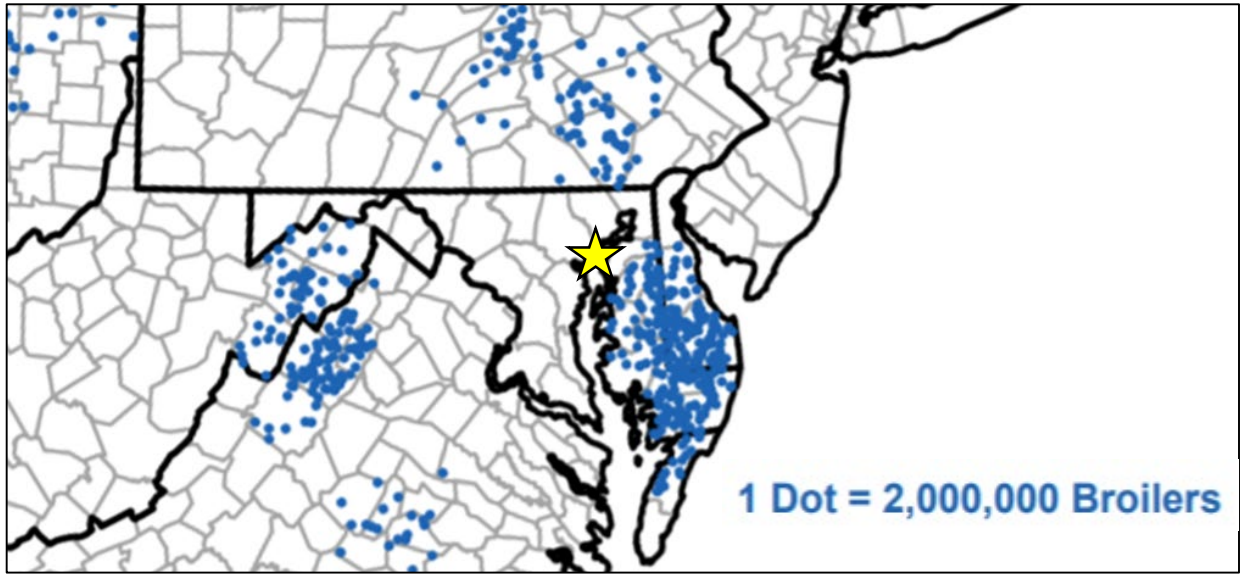


Agricultural Sources of Ammonia

Milk Cows - Inventory: 2012

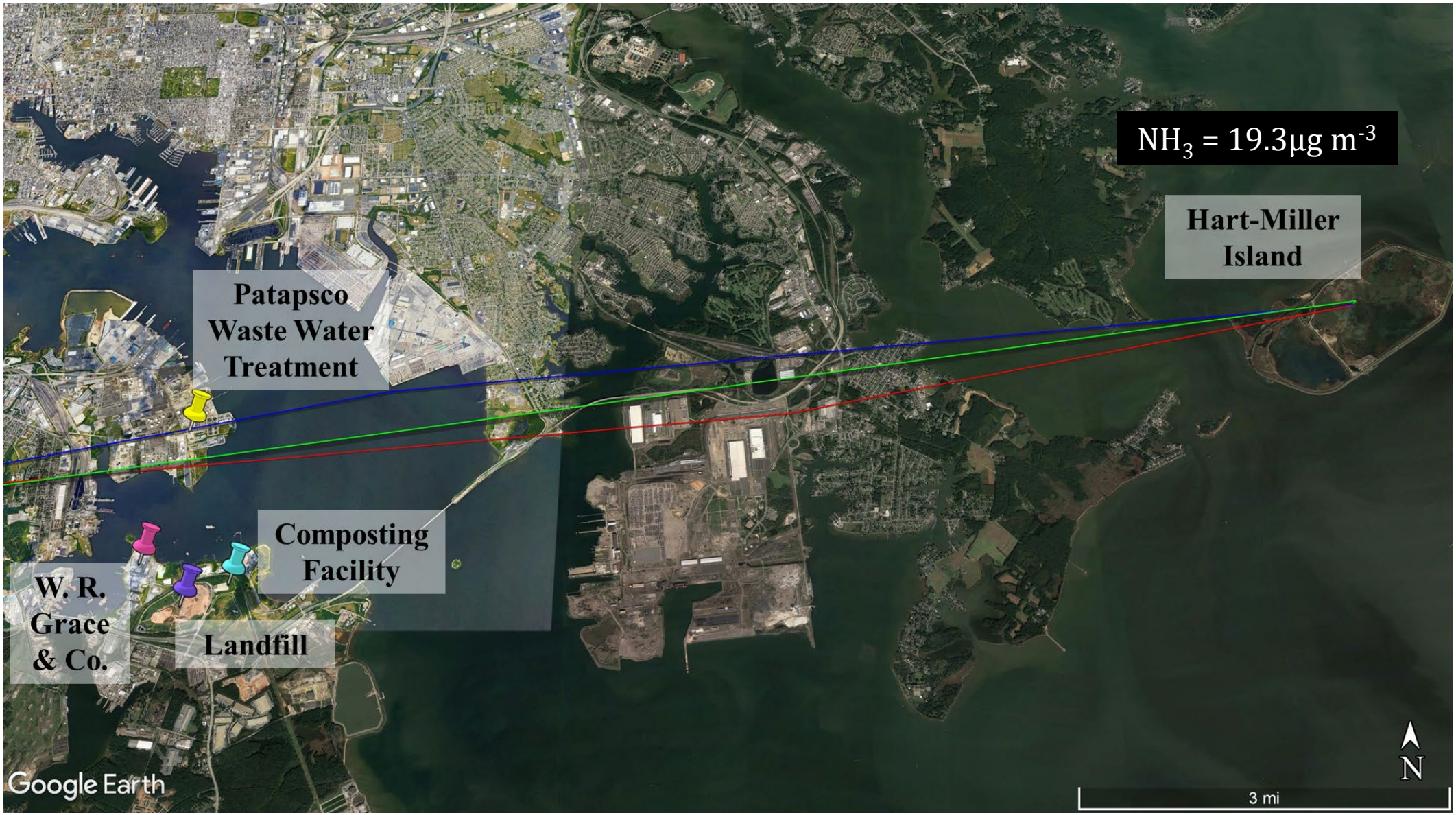


Number of Broilers and
Other Meat-Type Chickens Sold: 2012



Source: USDA 2012 Census of Agriculture
https://www.nass.usda.gov/Publications/AgCensus/2012/

Potential Industrial Ammonia Sources in Baltimore

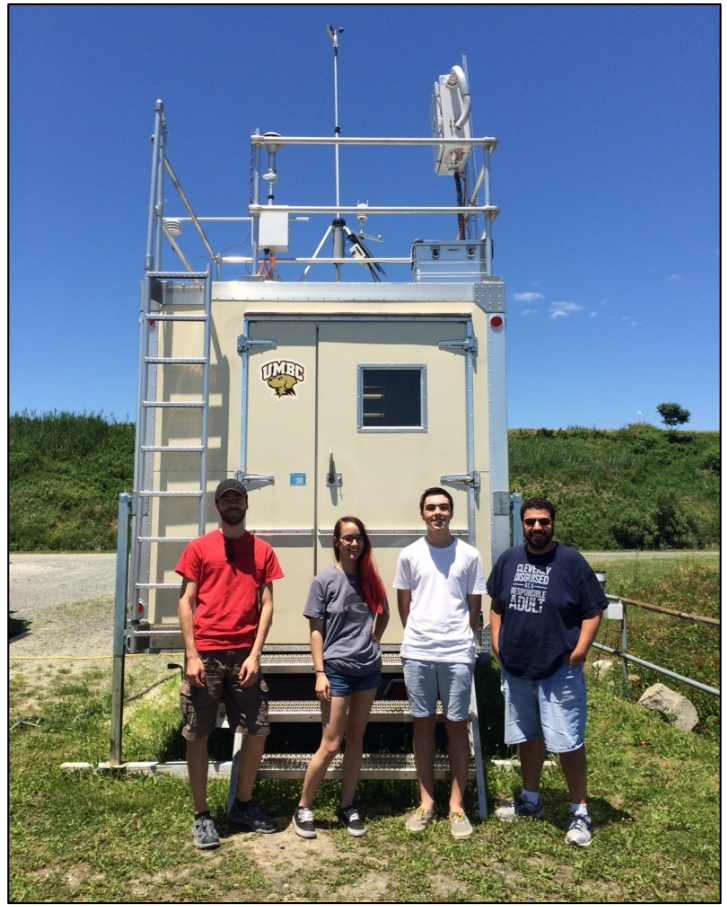


R^2 = 0.002 for NH_3 and CO… Likely no traffic influence.

Conclusions and Implications

- At HMI, ammonia and nitrate were high relative to historical trends.
- Significant agricultural ammonia emissions from poultry production in the Delmarva area.
- Periodic (but strong) influence from industrial/urban ammonia emissions from Baltimore.
- **Regional ammonia emissions impacted aerosol chemistry near Baltimore.**

Acknowledgments



<u>JCET</u>:
R. Delgado group

<u>Hennigan group</u>:
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Nick Balasus
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OWLETS-2
Ozone Water-Land Environmental Transition Study

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https://github.com/AirChem/HYSPLITcontrol

Related Talks

Friday, August 2nd, Point/Nonpoint Session, 9:15 – 9:40 am - Characterizing the Impact of Poultry and Cattle Farms on Chesapeake Bay Aerosols in Baltimore, MD During the OWLETS-2 Campaign – N. Balasus, M.Battaglia Jr, K. Ball, R. Delgado, and C.J. Hennigan, University of Maryland, Baltimore County.

Poster # 4 - The Impact of Regional Agricultural Emissions on Urban Aerosol Chemistry in the Eastern U.S. – K. Ball, N. Balasus, R. Delgado, M. Battaglia Jr, and C. J. Hennigan, University of Maryland, Baltimore County.